REMARKS

Claims 1 to 20, 22, and 23 are pending in the present application. A marked-up version of the claims is set forth in the attachment entitled "Marked-Up Version of the Claims."

Claim 21 has been cancelled.

Claims 1, 13 to 16, 18, and 22 have been amended for purposes of form and clarity. Claim 13 has been amended to correct dependency.

Claim 23 has been added. Support for the surface alignment structure being not treated with or formed from a material which will induce local homeotropic alignment is at least found at lines 2 to 3 of page 16 and lines 27 to 30 of page 8.

Claims 1 to 20, and 22 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 to 24 of copending Application No. 09/816,942 in view of U.S. Patent No. 5,917,570 to Bryan-Brown et al. (hereinafter "the '570 patent"). Since U.S. Patent Application No. 09/816,942 has not yet issued and since it does not disclose or suggest that which is recited in claims 1 to 20, 22, and 23, Applicants respectfully traverse this provisional rejection.

Applicants respectfully submit that the '570 patent fails to disclose or suggest alignments in a plurality of azimuthal directions for at least the reasons indicated below in relation to claim 22. Therefore, it would not have been obvious to a person of ordinary skill in the art to employ a bigrating structure in the bistable nematic liquid crystal of the reference claims to produce desired alignments in a plurality of azimuthal directions as cited by the Office Action. Furthermore, the reference claims are directed to a bistable nematic liquid crystal

device having a surface alignment comprising an array of posts which have at least one of a shape and an orientation to induce a liquid crystal director adjacent the posts to adopt *two different tilt angles* in *substantially the same azimuthal direction*. Current independent claims 1, 11, and 23 are directed to a liquid crystal device having a surface alignment structure providing a "single desired alignment". Current independent claim 21 is directed to a liquid crystal device having a surface alignment structure providing desired alignments to a liquid crystal director in a "plurality of azimuthal directions".

Claims 1 to 20 are rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,456,348 to Bryan-Brown et al. (hereinafter "the '348 patent").

The '348 patent describes a bistable nematic liquid crystal device in which the liquid crystal molecules are aligned by a surface alignment monograting coated with a surfactant that provides local homeotropic alignment to the liquid crystal material.

Applicants respectfully submit that the '348 patent fails to disclose or suggest a surface alignment structure comprising a two dimensional array of upstanding features. The alignment grating of the '348 patent is a monograting coated with a surfactant. Abstract and Col. 3, lines 49 to 50. The Office Action incorrectly asserts that the "monograting" of the '348 patent is a "two dimensional array." On the contrary, the monograting of the '348 patent is a one dimensional array which consists of a single row of walls defining parallel grooves. Support for this is found in the textbook *Reflective Liquid Crystal Displays*, Wiley (2001) by Wu and Yang, pp 261 to 262 (attached). In their discussion of the technology of the '348 patent (known as Zenithal Bistable Nematic Display) the authors refer to the alignment as "a one dimensional grating." The one dimensional monograting of the '348 patent is not a two dimensional array of upstanding features, as in claim 1. Therefore, Applicants respectfully submit that claim 1 is patentably distinguishable over the '348 patent.

Applicants respectfully submit that claims 2 through 14 which depend from claim 1 are also patentably distinguishable over the cited art for at least the reasons discussed above in relation to claim 1.

Claim 2 adds the feature that the "features" have a height in the range of about 0.5 to 5 μm.

Applicants respectfully submit that the '348 patent fails to disclose or suggest upstanding features having a height in the range of about 0.5 to 5 μm, as in claim 2. The "1-3 μm height" cited by the Office Action refers to the height of "small pillars." The small pillars of the '348 patent are "for assisting in correct spacing apart of the cell walls and also for a barrier to liquid crystal material flow when the cell is flexed." (col. 3, lines 59 to 61). The upstanding features of claim 2 are for producing a desired alignment of the liquid crystal material. Clearly the monograting, not the "small pillars", of the '348 patent are used for aligning the liquid crystal material: "a surface alignment grating on at least one cell wall that permits the liquid crystal molecules to adopt two different pretilt angles in the same azimuthal plane." (col. 3, lines 30 to 32). The small pillars are simply for spacing the cell walls and as a barrier to material flow. Therefore, claim 2 is further patentably distinguishable over the cited art.

Claim 4 adds the feature that at least part of a side wall of the features is tilted with respect to the normal to the plane of the first cell wall.

Applicants respectfully submit that the '348 patent fails to disclose or suggest at least part of the side wall of the features being tilted with respect to the normal to the plane of the first cell wall. The Office Action asserts that column 9, lines 54 through 58 describes tilt angle of the side wall of the posts. However, the cited portion of the '348 patent describes the angle from parallel between the grating groove directions on one cell wall and the rubbing alignment directions to prevent twist disclinations of the rubbed polymer surface of PI32

polyimide on the opposite cell wall. (see col. 9, lines 10 through 58). The Bryan-Brown et al. patent clearly fails to disclose or suggest the tilt angle of features, as recited in claim 4. Therefore, claim 4 further distinguishes over the '348 patent.

Claim 7 adds the feature that the liquid crystal material contains a surfactant.

Applicants respectfully submit that the '348 patent fails to disclose or suggest liquid crystal material containing a surfactant as in claim 7. The Office Action cites col. 3, lines 49 to 50 as support for the liquid crystal material containing a surfactant. However, this passage states that "[o]ne or both cell walls may be coated with a surfactant such as lethecin." In the '348 patent it is the monograting or opposite wall that is coated with the surfactant. The liquid crystal material of the '348 patent does not contain a surfactant. Therefore, claim 7 is further patentably distinguishable over the cited art.

Applicants respectfully submit that the '348 patent fails to disclose or suggest a surface alignment structure comprising an array of upstanding features which are at least one of shaped and orientated to produce the desired homeotropic or tilted homeotropic alignment, as in claim 15. The monograting of the '348 patent comprises parallel grooves. As is well known to persons skilled in the art of liquid crystal alignment, grooved surfaces tend to induce liquid crystal molecules to align in a planar manner, not homeotropic or tilted homeotropic as in claim 15, by lying with their long axes along the grooves. See page 4, lines 13 to 24 and the Berriman reference therein. Furthermore, it is necessary to coat the monograting of the '348 patent with a surfactant to induce a local homeotropic alignment, which would otherwise not occur. Col. 8, lines 28 to 30 states "[f]inally the grating surface is treated with a solution of a chrome complex surfactant in order to induce a homeotropic boundary condition." Col. 9, lines 60 to 62 states "The homeotropic treatment can be any surfactant which has good adhesion to the grating surface." It is the surfactant of the '348 patent that induces the homeotropic alignment, not the upstanding features which are at

least one of shaped and oriented to product the desired alignment, as in claim 15. Therefore, claim 15 is patentably distinguishable over the '348 patent.

Applicants respectfully submit that claims 16 and 17 which depend from claim 15 are also patentably distinguishable over the cited art for at least the reasons discussed above in relation to claim 15.

Claim 17 adds the feature that at least part of a side wall of the features is tilted with respect to the normal to the plane of the first cell wall.

Applicants respectfully submit that the '348 patent fails to disclose or suggest at least part of the side wall of the features being tilted with respect to the normal to the plane of the first cell wall for at least the reasons discussed above in relation to claim 4. Therefore, claim 17 further distinguishes over the cited art.

Applicants respectfully submit that the '348 patent fails to disclose or suggest a surface alignment structure comprising an array of upstanding posts, as in claim 18. The alignment structure of the '348 patent is a monograting surface. The Office Action incorrectly asserts that the "small pillars" of the '348 patent are posts, as in claim 18. As discussed above in relation to claim 2, the small pillars of the '348 patent are "for assisting in correct spacing apart of the cell walls and also for a barrier to liquid crystal material flow when the cell is flexed." (col. 3, lines 59 to 61). Clearly the "surface alignment grating", not the "small pillars", of the '348 patent are used for aligning the liquid crystal material: "a surface alignment grating on at least one cell wall that permits the liquid crystal molecules to adopt two different pretilt angles in the same azimuthal plane." (col. 3, lines 30 to 32). The small pillars are simply for spacing the cell walls and as a barrier to material flow. In contrast, the posts of claim 15 provide the alignment of the liquid crystal material. (see page 5, lines 15 and 16). Therefore, Applicants respectfully submit that claim 18 is patentably distinguishable over the cited art.

Applicants respectfully submit that claims 19 and 20 which depend from claim 18 are also patentably distinguishable over the cited art for at least the reasons discussed above in relation to claim 18.

Claim 19 adds the feature that at least part of a side wall of the features is tilted with respect to the normal to the plane of the first cell wall.

Applicants respectfully submit that the '348 patent fails to disclose or suggest at least part of the side wall of the features being tilted with respect to the normal to the plane of the first cell wall for at least the reasons discussed above in relation to claim 4. Therefore, claim 19 further distinguishes over the cited art.

Claim 22 is rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 5,917,570 to Bryan-Brown et al. (hereinafter "the '570 patent").

The '570 patent is directed to a liquid crystal display cell wherein the liquid crystal material is aligned by a grating structure on one or both cell walls. The grating structure is a bigrating with one symmetrical grating and an asymmetric grating which may be orthogonal to the symmetric grating.

Applicants respectfully submit that the '570 patent fails to disclose or suggest a surface alignment structure comprising an array of features which are at least one of shaped and orientated to produce the desired alignments to a liquid crystal director in at least three azimuthal directions, as in claim 22. Figures 5a and 5b of the '570 patent show alignment in different zenithal directions, not azimuthal directions, as in claim 22. Alignment in different zenithal directions is liquid crystal material aligned with different tilts in the same azimuthal plane. See, for example, col. 3, lines 15 to 19 of the '348 patent which describes the "same azimuthal plane as follows; let the walls of a cell lie in the x,y plane, which means the normal to the cell walls is the z axis. Two pretilt angles in the same azimuthal plane means two different molecular positions in

the same x,z plane." Figures 5a and 5b show alignments in the same x,z plane. Furthermore, claim 22 recites a surface alignment structure which provides desired alignments to a liquid crystal director "in at least three azimuthal directions. Figures 5a and 5b of the '570 patent only show alignment in one azimuthal direction and do not disclose or suggest the at least three azimuthal directions of claim 22. Therefore, Applicants respectfully submit that claim 22 is patentably distinguishable over the cited art.

Accordingly, Applicants respectfully submit that all claims presented in this application patentably distinguish over the prior art. Therefore, Applicants respectfully request favorable consideration and passage of the application to allowance.

Respectfully submitted,

March 6, 2003

Paul D. Greeley
Reg. No. 31,019
Attorney for the Applicants
Ohlandt, Greeley, Ruggiero & Perle, L.L.P.
One Landmark Square, 10th Floor
Stamford, CT 06901-2682
Tel: 203-327-4500
Fax: 203-327-6400

Marked-Up Version of the Claims

1. (Twice Amended) A liquid crystal device comprising:

a first cell wall and a second cell wall enclosing a layer of liquid crystal material;

electrodes for applying an electric field across at least some of ~~the~~ said liquid crystal material; and

a surface alignment structure on the inner surface of at least ~~the~~ said first cell wall providing a single desired alignment to ~~the~~ a liquid crystal director~~,~~;

wherein ~~the~~ said surface alignment structure comprises a two dimensional array of upstanding features which are at least one of shaped and orientated to produce the desired alignment; but not including any device in which the surface alignment structure comprises a sinusoidal bigrating.

13. (Twice Amended) A method of manufacturing a cell wall in accordance with claim ~~10~~11, comprising applying a plastics material to the surface of a wall, and embossing a two dimensional array of alignment features into ~~the~~ said plastics material; said method excluding any method which produces a sinusoidal bigrating.

14. (Amended) A method of manufacturing a liquid crystal device in accordance with claim 1, comprising securing a first cell wall ~~in accordance with claim 13~~ to a second cell wall, so as to produce a cell having spaced apart cell walls; filling the cell with a liquid crystal material, and sealing the cell; wherein one or both of ~~the cell walls~~said first cell wall and said second cell wall have at least one electrode structure thereon so that ~~the~~ said liquid crystal device has electrode structures for applying an electric field across at least some of ~~the~~ said liquid crystal material; wherein said first cell wall comprises a wall and said alignment structure on one surface thereof for providing a single desired alignment to the director of a liquid crystal material, wherein said first cell wall is manufactured by a method comprising applying a plastics material to the surface

of a wall, and embossing a two dimensional array of alignment features into said plastics material.

15. (Twice Amended) A liquid crystal device comprising:

a first cell wall and a second cell wall enclosing a layer of liquid crystal material;

electrodes for applying an electric field across at least some of ~~the~~ said liquid crystal material; and

a surface alignment structure on the inner surface of at least ~~the~~ said first cell wall providing at least one of a desired homeotropic or tilted homeotropic alignment to ~~the~~ a liquid crystal director~~,~~;

wherein ~~the~~ said surface alignment structure comprises an array of upstanding features which are at least one of shaped and orientated to produce the desired alignment.

16. (Amended) A device as claimed in claim 15, wherein said features have a height that ~~the height of the features~~ is at least equal to the average spacing between ~~the~~ said features.

18. (Twice Amended) A liquid crystal device comprising:

a first cell wall and a second cell wall enclosing a layer of liquid crystal material;

electrodes for applying an electric field across at least some of ~~the~~ said liquid crystal material; and

a surface alignment structure on the inner surface of at least ~~the~~ said first cell wall providing a desired alignment to ~~the~~ a liquid crystal director in a single azimuthal direction~~,~~;

wherein ~~the~~ said surface alignment structure comprises an array of upstanding posts which are at least one of shaped and orientated to produce the desired alignment.

22. (Twice Amended) A liquid crystal device comprising:

a first cell wall and a second cell wall enclosing a layer of liquid crystal material;

electrodes for applying an electric field across at least some of ~~the~~ said liquid crystal material; and

a surface alignment structure on the inner surface of at least ~~the~~ said first cell wall providing desired alignments to ~~the~~ a liquid crystal director in at least three azimuthal directions~~,~~;

wherein ~~the~~ said surface alignment structure comprises an array of features which are at least one of shaped and orientated to produce the desired alignments.

23. (New) A liquid crystal device comprising:

a first cell wall and a second cell wall enclosing a layer of liquid crystal material;

electrodes for applying an electric field across at least some of said liquid crystal material; and

a surface alignment structure on the inner surface of at least said first cell wall providing a single desired alignment to a liquid crystal director;

wherein said surface alignment structure comprises a two dimensional array of upstanding features which are shaped and/or oriented to produce the desired alignment; but not including any device in which the surface alignment structure comprises a sinusoidal bigrating or any device in which the said features are treated with or formed from a material which will induce local homeotropic alignment in the liquid crystal material.